Docket No. 02-IMP-068 EATNP146US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **PATENT** application of:

Applicant:	William F. DiVergilio et al.
Application No.:	10/702,368
For:	SEGMENTED RESONANT ANTENNA FOR RADIO FREQUENCY INDUCTIVELY COUPLED PLASMAS
Filing Date:	November 6, 2003
Examiner:	Ruby Zerbigon
Art Unit:	1763

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants submit this brief in connection with the appeal of the above-identified case.

I. Real Party in Interest (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest in the present appeal is Axcelis Technologies, Inc.

II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))

Appellant, appellant's legal representatives, and/or the assignee of the present application are unaware of any appeals or interferences which will directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))

Claims 13-18, and 20-29 are pending in the application. Claims 26-29 have been withdrawn from consideration. The rejection of claims 13-25 (which should instead be a rejection of claims 13-18 and 20-25) is appealed.

IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))

Claims 14-18 and 20-29 were amended after the Final Rejection dated August 23, 2007, to address a Section 112, second paragraph issue. These claim amendments were entered, as evidenced in the Advisory Action dated October 25, 2007.

V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))

According to the invention of independent claim 13 and referring generally to Figs. 3, 5 and 12-14, an ion shower system is provided, and comprises a plasma source operable to generate source gas ions within a chamber 102. The plasma source comprises a plurality of conductor segments 304, and a plurality of capacitors 306, wherein the conductor segments are serially connected through the plurality of capacitors, and wherein the series arrangement of conductor segments and capacitors reside within the chamber. (*See, e.g.*, page 19, lines 3-5, and Figs. 12-14). An antenna drive circuit 308 is coupled to the plurality of conductor segments, and is operable to provide power to the conductor segments and capacitors at a predetermined frequency. (*See, e.g.*, page 19, lines 5-6, Fig. 14). The plasma source further comprises a source gas inlet 124 that is operable to provide a source gas to the chamber 102. (*See, e.g.*, page 9, lines 3-4). The conductor segments, capacitors and antenna drive circuit cooperatively provide energy to charged particles in the chamber, thereby energizing the charged particles and generating a plasma comprising source gas ions and electrons within the chamber due to ionizing collisions between the energized charged particles and the source gas. (*See, e.g.*, page 20, lines 5-25). An extraction assembly 116 is further provided, and is associated with the chamber and is operable to extract source gas ions therefrom. (*See, e.g.*, page 9, lines 21-23).

Further, in accordance with the invention of claim 16, the ion shower system further comprises a feature that the conductor segments have an inductive reactance and the capacitors have a capacitive reactance associated therewith. In the arrangement, one of the conductors and one of the capacitors form an antenna

segment, wherein the inductive reactance and capacitive reactance of the antenna segment are equal at the predetermined frequency. (*See, e.g.*, Fig. 14; page 21, line 22 – page 22, line 6).

In addition, in accordance with the invention of claim 20, the plurality of conductor segments and capacitors are arranged within the chamber in an azimuthally symmetric fashion. Accordingly, a non-uniform capacitive electrostatic field component along each conductor segment is repeated in an azimuthally symmetric fashion, and thereby contributes to an azimuthally symmetric plasma within the chamber. (*See, e.g.*, Fig. 12; page 19, lines 22-25; page 22, lines 7-10).

In accordance with the invention of claim 21, a further feature of the ion shower system comprises the extraction assembly being associated with a top portion of the chamber, wherein the extraction assembly is operable to extract ions vertically from the top portion thereof. (*See, e.g.*, Figs. 3 and 5; page 9, line 21 – page 10, line 10).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))

Claims 13-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 2001/63981 (Weiler) in view of U.S. Patent No. 5,846,883 (Moslehi). Please note that references to the Weiler reference herein cite to the corresponding U.S. Patent No. 6,936,144, for the Board's easy reference).

VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))

A. REJECTION OF CLAIMS 13-25 UNDER 35 U.S.C. § 103(a)

Claims 13-25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 2001/63981 (Weiler) in view of U.S. Patent 5,846,883 (Moslehi). Initially, claim 19 has been canceled. A reversal of the rejection of claims 13-18 and 20-25 is requested for at the least the following reasons.

i. ***The combination of Weiler and Moslehi is improper because a combination therefore will render Weiler unsatisfactory for its intended purpose.***

In the response to the Non-final Office Action of March 12, 2007, an argument was presented that the proposed combination of Weiler and Moslehi was improper due to a lack of the requisite motivation to make the suggested combination. More particularly, the Non-final Office Action conceded that Weiler did not teach a plurality of conductor segments serially connected together through a plurality of capacitors, however, since Moslehi did provide such a feature, a combination of Weiler and Moslehi taught the claim feature at issue and rendered claim 13 obvious thereover.

In traversing the rejection, the argument proffered by the applicant in the response of June 6, 2007 was that since Weiler taught a particular combination of conductor segments in which ***each conductor segment was connected to its own separate high frequency generator***, a modification of Weiler in view of Moslehi would not be proper because such a modification would render Weiler unsatisfactory for its intended purpose. The Final Office Action of August 23, 2007 rejected the submitted argument by stating that the above argument constituted an attack on the Weiler reference individually when the rejection was based on a the combination of references. (O.A., 8/23/07, p. 9, paragraph 10). It is respectfully submitted that the above rationale for maintaining the rejection constitutes either a misunderstanding of the law or a misapplication of the principle as applied to the present facts in this application.

While it is true that nonobviousness cannot be shown by attacking references individually, that is not what is being done in the present argument. Rather, an analysis has been made as to whether one of ordinary skill in the art would have been motivated to modify Weiler in view of Moslehi when evaluating both references ***in their entirety***. More particularly, claim 13 recites an ion shower system having a plasma source that comprises a plurality of conductor segments and ***a plurality of capacitors serially connected through the conductor segments***. As conceded in the Office Actions, Weiler does not teach this feature, however, the Office Actions assert that Moslehi does teach this feature and that it would have been obvious to arrive at the feature of claim

13 by combining together Weiler and Moslehi. (*See*, O.A., 3/12/07, p. 9). Therefore according to the Office Actions it would have been obvious to modify Weiler, which the Office Actions concede does not have capacitors serially connected through the conductor segments, based on the teaching of Moslehi which does teach such an arrangement. Such a modification, however, would only be appropriate in those instances where one of ordinary skill in the art would be motivated to do so. In this particular case, however, based on the teachings of Weiler ***when properly evaluated as a whole, a modification thereof in view of Moslehi would render Weiler unsatisfactory for its intended purpose***, and the MPEP explicitly states that in such instances no motivation exists for such modifications. MPEP § 2143.01 (V).

More particularly, Weiler discloses in Figs. 1 and 2a-2j (and corresponding text) a plasma source having a plasma excitation electrode. As shown in Figs. 2a-2j, the excitation electrode (that corresponds to the claimed conductor segment of claim 13 according to the Office Actions) may comprise a single element or multiple segments. (*See, e.g.*, Figs. 2e-2j). ***In instances where the excitation electrode 3 consists of multiple segments, each segment or electrode is connected to its own separate matching network and its own separate high frequency generator.*** (*See, e.g.*, Col. 4, lines 27-30). According to Weiler, connecting each electrode segment to its own separate power source (generator) is provided ***to generate different kinds of plasmas so as to control and adjust beam characteristics.*** (*See, e.g.*, Col. 4, lines 30-33). Thus the intended purpose of Weiler is to have flexibility to generate different kinds of plasmas by being able to individually address or drive each electrode segment.

Therefore one of ordinary skill in the art would not be motivated to modify the multiple, isolated electrode segment configurations of Weiler by serially coupling such segments together *via* capacitors because doing so would contravene the intended purpose of Weiler (which was to separately drive each segment with its own power source to generate different plasmas and thus control and adjust beam characteristics) by eliminating the ability to generate different plasmas by individually driving the various conductor segments. Therefore the requisite motivation to combine the cited art does not exist, and consequently the combination of Weiler and Moslehi is improper. MPEP

§ 2143.01 (V) (*citing* In re Gordon, 733 F.2d 900 (Fed. Cir. 1984) (holding that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification).

Accordingly, reversal of the rejection is respectfully requested.

ii. ***A combination of Weiler and Moslehi does not teach the invention because such a combination does not result in a series connection of capacitors and conductor segments residing within the chamber, as recited in claim 1.***

Regarding claim 13, an argument was provided in the response to the Non-final Office Action of March 12, 2007 that even if the combination of Weiler and Moslehi was deemed proper (which applicant does not concede) the combination of Weiler and Moslehi fail to render claim 13 obvious because neither reference teach a series arrangement of ***conductor segments and capacitors*** that resides ***within the chamber*** as claimed. In rejecting this argument, the Final Office Action of August 23, 2007 again asserted that each of the references were improperly being attacked individually. Applicant respectfully disagrees.

Both Weiler and Moslehi were analyzed to ascertain whether either reference provided a teaching of an arrangement within a chamber. The Final Office Action conceded that Moslehi explicitly teach a series arrangement of conductor segments and capacitors ***external*** to the chamber. (O.A., 8/23/07, p. 9, paragraph 11) (*See also, e.g.*, paragraph [0057], lines 15-21, and paragraph [0113], lines 6-9 of Moslehi). While the Final Office Action asserts that Weiler teach its conductor segments in its chamber, applicant respectfully submits that the conclusion drawn therefrom that any ***capacitors*** serially coupled to the conductors would also be in the chamber is incorrect.

With reference to Fig. 1 of Weiler, the outer wall 7 of the chamber defines three sides of the chamber, while a contoured mounting element 1 defines the fourth chamber side. While the excitation electrodes 3 reside inside the chamber, ***they electrically connect to their respective power source 8*** via a conductor that extends ***outside of the chamber*** via a feedthrough 9. Consequently, ***the electrical connection of an***

excitation electrode to any other components (the matching network 2 and RF source 8) ***happens external to the chamber*** (*i.e.*, on the opposite side of the mounting element 1 than the electrode 3). Therefore one of ordinary skill in the art, upon evaluating Weiler as a whole, would couple a capacitor to a respective excitation electrode 3 at the end of the external conductor that extends into the chamber *via* the feedthrough 9, just as the matching network 2 and RF source are connected to the electrode ***outside of the chamber***. This characterization of Weiler is further supported by the teaching of Weiler, wherein the magnetic field coils 4 are also located ***external*** to the chamber 7 *via* the contoured mounting element 1, as illustrated in Fig. 1.

Therefore ***neither reference*** provides any support for a series arrangement of conductor segments and capacitors ***within the chamber*** as claimed. Therefore the references are not being attacked individually, but instead are each being evaluated for what they teach in their entirety. ***Since neither reference provides any teaching or suggestion for a series arrangement within the chamber, the combination of Weiler and Moslehi fail to render the invention of claim 13 obvious.*** Therefore a reversal of the rejection of claim 13 is respectfully requested for at least this additional reason.

iii. ***The combination of Weiler and Moslehi does not teach an azimuthally symmetric arrangement of the conductor segments and capacitors, as recited in claim 20.***

The Final Office Action of August 23, 2007, in responding to our arguments that the subject matter of claim 20 is not taught in either reference, and thus their combination certainly cannot obviate the claim, asserted that our arguments constitute an inappropriate attack on the references individually, as opposed to considering their combination. This is incorrect, because the point being made is that when considering both references in combination ***the combination does not provide for the claim feature.***

Claim 20 depends upon claim 13, and further recites that the ***series arrangement*** of conductor segments ***and*** capacitors are arranged within the chamber

in an azimuthally symmetric fashion. Initially, Moslehi does not teach the ***capacitors arranged azimuthally symmetric within the chamber*** as recited in the claimed invention. While ***conductor segments*** 186, 190 and 194 in Fig. 2 of Moslehi are arranged azimuthally, ***the capacitors that couple such segments together are not arranged in the azimuthally symmetric fashion as claimed***. Rather, such capacitors follow the direction of the jumper water channels 214, 218, 226 and 230 illustrated in Fig. 2, and which is NOT azimuthally symmetric. ***Weiler does not remedy the deficiencies of Moslehi.*** In Figs. 2e-2j of Weiler, none of the multiple conductor segment configurations are arranged azimuthally.

In the Office Action, it states that Weiler teach conductor segments that are azimuthally symmetric, citing to element 3 of Figs. 1, 2 and 4, respectively. In looking at Figs. 2a-2j, it is noted that only Figs. 2e-2j illustrates multiple conductor segments. ***Of those figures, none of them show the conductor segments arranged azimuthally.*** For example, in Fig. 2j, four conductor segments are arranged in a square, but such segments are not arranged azimuthally as claimed. In Figs. 4a-4n magnetic coil assemblies are illustrated, not conductor segments connected to capacitors. (*See, e.g.*, Col. 6, lines 55-57). ***Therefore neither reference teach this arrangement, either alone or in combination.*** Consequently, claim 20 is non-obvious over the cited art. Accordingly, for at least this additional reason, reversal of the rejection is respectfully requested.

iv. ***The combination of Weiler and Moslehi does not teach a plurality of multi-cusp magnets on side portions of the chamber, as recited in claim 23.***

Claim 23 depends upon claim 13, and further recites that side portions of the chamber comprise a plurality of ***multi-cusp magnets*** operable to produce multi-cusp magnetic fields. The combination of the cited references does not teach this feature.

Contrary to the assertion within the Final Office Action (*see* O.A., 8/23/07, p. 4, paragraph vi), Weiler does not teach a plurality of multi-cusp magnets as claimed. Weiler does teach a magnetic field coil arrangement, as illustrated in Fig. 1, however,

such coil arrangement does not constitute multi-cusp magnets and do not produce multi-cusp fields as claimed.

The Office Action ignores that lack of teaching in Weiler, and instead asserts that "the magnetic field in discussion is a function of Weiler's current process variable. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent." (O.A., 8/23/07, p. 11, paragraph 12). This assertion is incorrect in light of the Weiler reference.

Weiler clearly show a magnetic field coil arrangement 4 and such coil arrangements are typically employed to generate a generally uniform dipole field therebetween. ***A plurality of multi-cusp magnets is not the same structurally as the unitary coil arrangement of Weiler, and the resultant dipole magnetic field is not anything similar to a plurality of multi-cusp magnetic fields produced by the plurality of multi-cusp magnets as claimed,*** and such a distinction is well known and appreciated by one of ordinary skill in the art.

Therefore claim 23 is non-obvious over the cited art for at least this additional reason. Accordingly, withdrawal of the rejection of claim 23 and depending claims 24-25 is respectfully requested.

B. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be patentable over the cited references. Accordingly, it is respectfully requested that the rejections of the pending claims be reversed.

For any extra fees or any underpayment of fees for filing of this Brief, the Commissioner is hereby authorized to charge the Deposit Account Number 50-1733, EATNP146US.

Respectfully submitted,
ESCHWEILER & ASSOCIATES, LLC

/Thomas G. Eschweiler/
Thomas G. Eschweiler
Registration No. 36,981

National City Bank Building
629 Euclid Ave., Suite 1000
Cleveland, Ohio 44114
(216) 502-0600

VIII. Claims Appendix (37 C.F.R. § 41.37(c)(1)(viii))

1-12. (Canceled).

13. (Previously presented) An ion shower system, comprising:

a plasma source operable to generate source gas ions within a chamber, wherein the plasma source further comprises:

a plurality of conductor segments;

a plurality of capacitors, wherein the conductor segments are serially connected through the plurality of capacitors, wherein the series arrangement of conductor segments and capacitors reside within the chamber;

an antenna drive circuit coupled to the plurality of conductor segments, and operable to provide power to the conductor segments and capacitors at a predetermined frequency; and

a source gas inlet,

wherein the source gas inlet is operable to provide a source gas to the chamber, and wherein the conductor segments, capacitors and antenna drive circuit cooperatively provide energy to charged particles in the chamber, thereby energizing the charged particles and generating a plasma comprising source gas ions and electrons within the chamber due to ionizing collisions between the energized charged particles and the source gas;

an extraction assembly associated with the chamber, and operable to extract source gas ions therefrom.

14. (Previously presented) The ion shower system of claim 13, further comprising a workpiece support structure associated with the chamber, and operable to secure the workpiece for implantation thereof of source gas ions from the extraction assembly.

15. (Previously presented) The ion shower system of claim 13, wherein first and last conductor segments of the plurality of conductor segments form an input, and wherein the antenna drive circuit is coupled to the input.

16. (Previously presented) The ion shower system of claim 13, wherein the conductor segments have an inductive reactance associated therewith, and wherein the capacitors have a capacitive reactance associated therewith, and wherein one of the conductors and one of the capacitors form an antenna segment, wherein the inductive reactance and capacitive reactance of the antenna segment are equal at the predetermined frequency.

17. (Previously presented) The ion shower system of claim 13, wherein the plurality of conductor segments and plurality of capacitors form a resonant circuit at the predetermined frequency.

18. (Previously presented) The ion shower system of claim 13, wherein the antenna drive circuit comprises an oscillator circuit.

19. (Canceled).

20. (Previously presented) The ion shower system of claim 13, wherein the plurality of conductor segments and capacitors are arranged within the chamber in an azimuthally symmetric fashion, wherein a non-uniform capacitive electrostatic field component along each conductor segment is repeated in an azimuthally symmetric fashion.

21. (Previously presented) The ion shower system of claim 13, wherein the extraction assembly is associated with a top portion of the chamber, and is operable to extract ions vertically from the top portion thereof.

22. (Previously presented) The ion shower system of claim 21, further comprising a workpiece support structure associated with the top portion of the chamber, and operable to secure the workpiece having an implantation surface orientated facing downward toward the extraction assembly for implantation thereof.

23. (Previously presented) The ion shower system of claim 13, wherein the chamber further comprises a bottom portion and side portions, and wherein the side portions comprise a plurality of multi-cusp magnet devices operable to produce multi-cusp magnetic fields thereat to facilitate an azimuthal uniformity of plasma within the chamber.

24. (Previously presented) The ion shower system of claim 23, wherein the multi-cusp magnet devices comprise electromagnets operable to provide a variation in multi-cusp magnetic field strength at differing positions along the side portions.

25. (Previously presented) The ion shower system of claim 24, wherein the electromagnets are independently controllable, thereby facilitating a tuning of the multi-cusp magnetic fields.

26. (Withdrawn) The ion shower system of claim 13, wherein the plasma source further comprises two grounding rods operable to collect excess electrons within the chamber during extraction of ions from the top portion thereof.

27. (Withdrawn) The ion shower system of claim 26, wherein the two grounding rods are silicon coated, and wherein when one of the grounding rods is grounded, the other grounding rod is negatively biased with respect to plasma within the chamber, thereby causing the other grounding rod to be sputtered by the plasma and substantially preventing the other grounding rod from becoming an insulator due to excessive oxidation thereof.

28. (Withdrawn) The ion shower system of claim 27, wherein the two grounding rods are coupled to a square-wave voltage associated with the plasma source, and wherein a phase difference of the square-wave voltages between the two grounding rods is approximately 180 degrees.

29. (Withdrawn) The ion shower system of claim 13, the extraction assembly comprising a plurality of electrodes, wherein a first electrode comprises a plasma electrode having a plurality of extraction apertures associated therewith, and a second electrode comprises an extraction electrode biased negatively with respect to the chamber and disposed between the plasma electrode and the workpiece support structure, the extraction electrode having a plurality of extraction apertures substantially aligned with respect to the plasma electrode extraction apertures, and further comprising one or more interstitial pumping apertures operable to reduce a pressure thereat to a second pressure substantially less than the first pressure.

IX. Evidence Appendix (37 C.F.R. § 41.37(c)(1)(ix))

No additional evidence not already part of the official record is relied upon in the arguments provided herein.

X. Related Proceedings Appendix (37 C.F.R. § 41.37(c)(1)(x))

Not applicable.